

***United States Court of Appeals
for the Second Circuit***



**APPELLANT'S
REPLY BRIEF**

74-1629-1632

United States Court of Appeals

FOR THE SECOND CIRCUIT

Nos. 74-1629 & 74-1632

HELLENIC LINES LIMITED,

Plaintiff-Appellant,

—against—

LIFE INSURANCE CORPORATION OF INDIA,

Defendant-Appellee.

HELLENIC LINES LIMITED,

Plaintiff-Appellant,

—against—

AETNA CASUALTY & SURETY COMPANY, et al.,

Defendants-Appellees.

ON APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES
FOR THE SOUTHERN DISTRICT OF NEW YORK

**REPLY BRIEF FOR PLAINTIFF-APPELLANT
HELLENIC LINES LIMITED**

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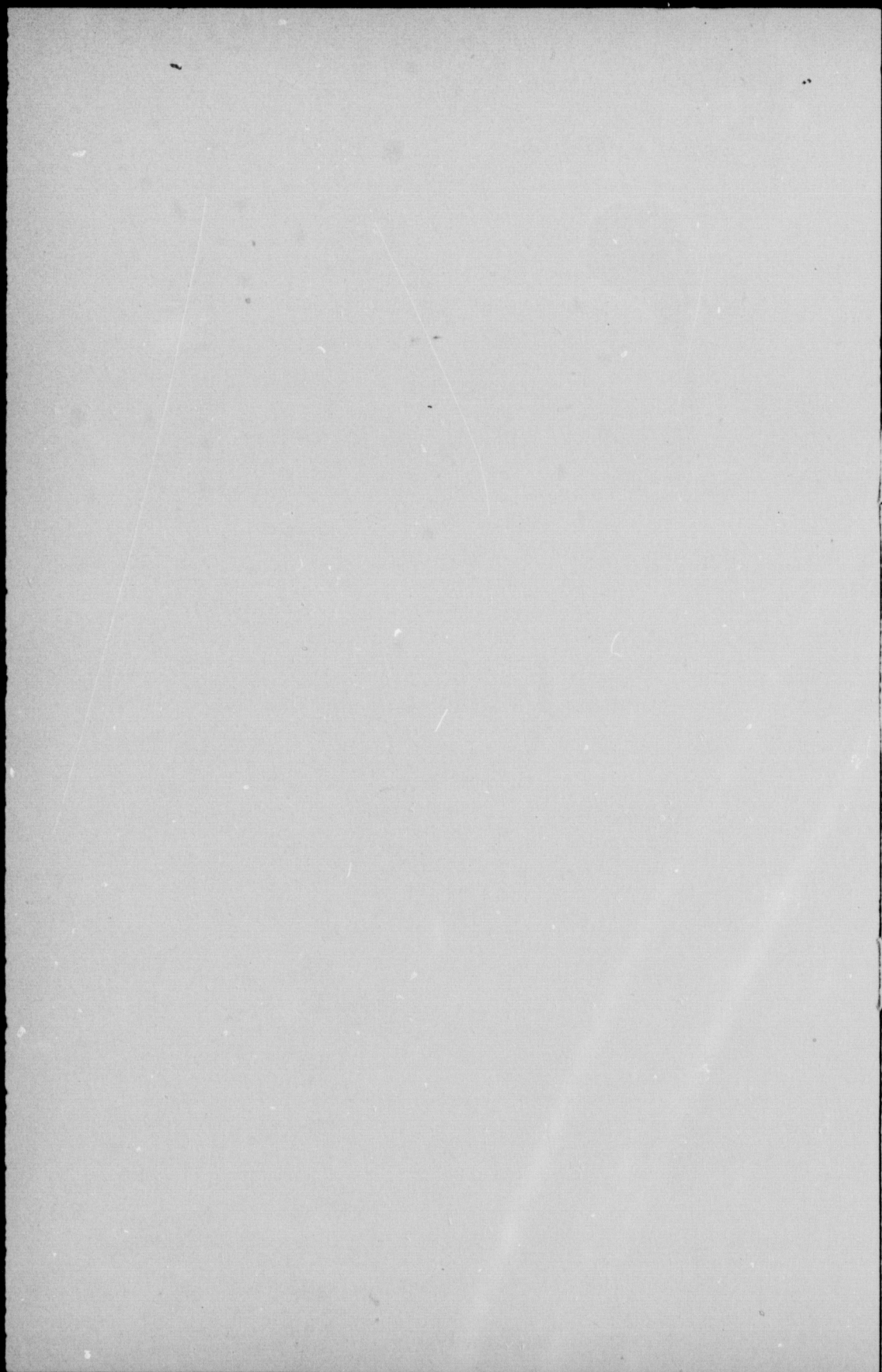
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Introductory Statement

Cargo Underwriters ignore or skirt around the issues raised by Hellenic, throwing in a jumble of disjointed observations calculated to obscure certain basic facts and principles, in a case which, at first blush, may appear to raise "highly technical" questions (Appellees' Brief, 2), but in reality requires only application of practical sense.

Such response as is offered by Cargo Underwriters on the issues will be discussed in this brief, along with inaccuracies in Cargo Underwriters' description and interpretation of the evidence and applicable principles of law.

**Reply to Cargo Underwriters' Points I-II
(Appellees' Brief, 3-7)**

Cargo Underwriters contend that there is no question of law on this appeal because, in their view, the only such question decided by the District Court was what constituted "the beginning of the voyage" (Appellees' Brief, 3-4). They raise that point only to argue its mootness by asserting broadly that Hellenic's practices in respect of alignment of the HELLENIC SAILOR's crankshaft were inadequate "long before the voyage" concerned, an assertion without foundation, either in the record or in the Court's opinion.

Cargo Underwriters, however, misapprehend the nature and effect of the holding below. The thrust of the District Judge's conclusion that, notwithstanding the October 11, 1967 wire gauge tests conducted prior to the commencement of the voyage and the physical evidence of satisfactory shaft alignment and condition of the main bearings found at Port Sudan following the fracture, Hellenic had not proved due diligence, is the setting of a standard of due diligence (which, under the circumstances of the case and for the reasons set forth in Hellenic's Main Brief at pages 39-43, is an unreal and impossible one).

Hellenic's position at trial was that the October 11, 1967 wire gauge readings (and those over the years preceding the casualty) were a proper and sufficient test of Sun-Doxford crankshaft alignment, the adequacy of which was borne out by the physical facts that precluded misalignment as

a cause of the fracture. The District Judge disagreed and held Hellenic (unable to document further wire gauge readings or, in the Court's view, satisfactorily account for the absence of specific web deflection readings) to a higher and different standard.

In a similar context this Court has stated:

"There is no dispute of fact: i.e., as to what the actual test was * * * ; the only question is whether that test constituted 'due diligence'; and that issue is not of fact, for it involves setting the standard of care which the situation demanded. Although it is left to juries in actions tried to a jury, upon appeal from the decision of a judge we treat it as a question of law."

Continental Ins. Co. v. United States, 195 F.2d 527, 528 (2 Cir. 1952) (reviewing the adequacy of a test of a vessel's discharge assemblies, intended to determine their capacity to withstand water pressure from without the ship). See also, *Esso Standard Oil S.A. v. S.S. Gasbras Sul*, 387 F.2d 573, 579 (2 Cir.), *cert. denied*, 391 U.S. 914 (1968); *J. Gerber & Co. v. S.S. Sabine Herwaldt*, 437 F.2d 580, 594 (2 Cir. 1971), and cases cited. The thrust of these decisions, as applied here, is that the trial judge's determination that the proof did not establish exercise of due diligence or due care by Hellenic is not a finding of fact, immune from review and reversal by this Court unless "clearly erroneous", but on appeal is treated as presenting a question of law which is reviewable as such. Moreover, even the trial judge's true findings based on "secondary or derivative inferences" from facts which he directly inferred from testimony or other evidence are, as always, open in this Court and must be disregarded "when the derivative inference either is not rational or has but a flimsy founda-

tion in the testimony." *American Tobacco Co. v. The Katingo Hadjipatera*, 194 F.2d 449, 451 (2 Cir. 1951), *cert. denied*, 343 U.S. 978 (1952). And the same must be equally true as to direct inferences based upon the trial judge's patent misconception or disregard of physical facts and evidence.

**Reply to Cargo Underwriters' Point III
(Appellees' Brief, 8-16)**

Cargo Underwriters suggest, in a summary sentence, that only one alignment reading was taken by Haugestad at Port Sudan (Appellees' Brief, 9), thus ignoring all of his eye witness testimony, as well as Allan's and the documentary evidence, with respect to the nature and results of the tests by telescope conducted during February 3-4 (analyzed in Hellenic's Main Brief, 32-36). Cargo Underwriters then bury in an accompanying footnote their contention that their one selected reading (Exh. 36) was "unreliable", an argument which they submit the District Judge agreed with. However, Haugestad measurements at Port Sudan (Exhs. 36 and 39) resulted in three readings, *not one*,¹ and Allan's deposition in no way suggests he considered one of these (Exh. 36) "unreliable". In fact, Allan said that as a result of Haugestad's three readings he reached the conclusion that alignment was "almost perfect" (657a).

In response to a broad question, Allan merely expressed his view that the one alignment recorded on Exhibit 36 does not reflect the shaft's alignment when the HELLENIC

	No. 4	No. 3	No. 2
¹ Exhibit 36	-.016	-.026	-.017
Exhibit 38	-.019	-.016	-.015
Exhibit 39†	-.020	-.021	-.021

† (With shaft pulled down tight in Nos. 2 & 3 bearings)

SAILOR departed New York in November, 1967 "because the shaft was lying in a different position after the web fracture (655a-656a)." Although Allan, at the time of his deposition, had forgotten that the crack in the otherwise intact web had been closed by Van Cooten by February 3, his answer was, of course, literally or technically true as a general proposition. Compare the three readings taken at Port Sudan with the shaft in different positions, showing slight differences, but differences nevertheless. Pressed by Cargo Underwriters' counsel to admit that if the alignment had been "absolutely perfect" there would have been no change in the readings, Allan responded "but it is impossible with a piece of equipment that weighs 120 tons and * * * .006 [the difference at No. 2 bearing with the shaft pulled down tight and without it being pulled down tight] is about the thickness of that piece of paper you are holding (657a)."

Evangelou was hardly "reluctant" (Appellees' Brief, 9, footnote 2) to admit that by February 3 the weight of all pistons and connecting rods was removed from the No. 2 crank section. He testified to such removal readily and unequivocally, giving the specific date of removal, viz., January 9, 1968, after reference to a document before him on the witness stand (255a-256a). More significantly, such weight removal was amply compensated for in the readings taken by Haugestad with the shaft pulled down tight in Nos. 2 and 3 bearings, which the District Judge simply could not understand, either as to the tightening down process used or, more important, the factual, physical effect thereby obtained (434a-437a). The District Judge rejected Haugestad's "opinion", not because he quarrelled with Haugestad's techniques, but because the judge developed his own mistaken syllogistic deduction that the sag was necessarily greater before and at the time of the frac-

ture than it was on February 3 (463a-465a). The judge simply would not, or could not, accept the physical facts that the cracked web was intact, with the crack mended, and that shaft alignment inevitably was no worse on departure from New York or thereafter than on February 3, 1968 (Hellenic's Main Brief, 34-35).

Cargo Underwriters' allusion to Allan's being "advertised" as Hellenic's second principal witness, but not called at trial, is wide of the mark (Appellees' Brief, 14), inasmuch as he was within subpoena range and equally available to Cargo Underwriters at trial. In any event, within minutes after the trial began, the Court was informed by Hellenic's counsel that Allan was at that very moment hospitalized, as he had been for the preceding ten days after suffering a hiatus hernia and blacking out as a result of internal bleeding (125a). The Court took the position that the trial would not be delayed pending Allan's recovery (375a). Allan was expecting to be discharged from the hospital, and in fact was during the middle of the trial. As Hellenic's counsel further advised the Court, at that juncture, in response to the Court's efforts to estimate what further time the proceedings would require, Hellenic preferred to rely upon his live testimony but was "bound not only by Mr. Allen's (*sic*) physical condition but also by his doctor's orders (369a)." In fact, by the morning, a few days later, when Allan had been "advertised" to appear, Hellenic's counsel had concluded that, in his present *physical* condition, Hellenic's retired 70-year-old former marine superintendent (704a) had not regained his health sufficiently to warrant subjecting him to the ordeal of courtroom interrogation, particularly, concerning events which took place some six or seven years before. Accordingly, Hellenic's counsel advised the Court of their decision not to call Allan "in his present condition" (422a).

There was no "conflict between Haugestad and Allan." Contrary to Cargo Underwriters' misleading assertion, Allan never said that the February 3 readings were "of no significance" (Appellees' Brief, 13-14). Allan himself had Haugestad dispatched to Port Sudan (655a), was present when Haugestad took his readings and was well aware of their significance. The whole purpose of the Van Cooten repairs was to permit the HELLENIC SAILOR to depart Port Sudan and resume her voyage on all four cylinders. This would have required a certificate from the Lloyd's surveyor, also in attendance, that the shaft's alignment was satisfactory, and Allan's and Haugestad's determination that the alignment was satisfactory coincided with that of Lloyd's surveyor in his report following abandonment of the Van Cooten repairs (Exh. 65). Cargo Underwriters, unable to answer the point made in Hellenic's Main Brief, at 35-36, conveniently ignore it.

Although generously conceding Haugestad's "extensive experience with marine engines" (Appellees' Brief, 15), Cargo Underwriters nevertheless attack his "standing to *express an opinion* concerning the suitability of crankshaft alignment in a Doxford engine (emphasis added)". presumably in reference to the wire gauge or telescope methods. The stated reason? Haugestad's views with regard to web deflection measurements on Sun-Doxford engines, purportedly discredited in Point IV of Cargo Underwriters' Brief (replied to herein at pages 16 f.f., *infra*). Not a single witness, including Bates, contradicted Haugestad in regard to his fact and expert testimony, i.e., as to his actual observations and standards (or "tolerances" to use the term favored by the District Judge) by which to evaluate his observations.

Cargo Underwriters ignore Haugestad's testimony based upon 30 years' experience with respect to acceptable limits

for sag in either light or loaded condition (all as summarized in Hellenic's Main Brief, 11-12). Though they counter-offered no expert testimony of their own, they seek to equate "acceptability" with "perfection." Cargo Underwriters' only bench marks: the August 16, 1968 readings at Bombay (Exh. Q) and the September, 1962 readings at Piraeus (Exh. E)—an irrational point of reference for the October 11, 1967 readings at New York, which were in all respects satisfactory from an operational standpoint, but were taken when the 120-ton crankshaft had been operating in the main bearings, without difficulty, for a period of some five years since new lower halves were installed in October-November, 1962 (Hellenic's Main Brief, 13). The wire gauge readings taken in Bombay in August, 1968 (Exh. Q) were final readings of shaft alignment after the HELLENIC SAILOR had been at the shipyard in connection with replacement of the fractured No. 2 crankshaft section and related repairs for some 21½ months. That the bearings were, on that occasion, adjusted to reduce the sag "tenfold" (Appellees' Brief, 15) is hardly surprising in view of the wisdom of any shipowner's maximizing adjustments by repairs when an occasion for repairs arises. Similarly, as to the September, 1962 readings, which were taken in connection with repairs and realignment at Piraeus.

The alignments attained on such occasions cannot set the standard by which the prudent shipowner must judge the fitness of the vessel's equipment from an "operational standpoint," any more than could the shaft alignment on construction by Sun Shipbuilding in 1939 (Appellees' Brief, 15, footnote 4). After all, ships are built to sail or operate and, as the District Judge appreciated, "shaft alignment in a ship under operating circumstances is never perfect (590a)."

One would scarcely quarrel with Cargo Underwriters' selection and characterization of the Bombay readings and Piraeus readings as examples of "desirable crankshaft deflection" (Appellees' Brief, 15); the rub comes from their implying, if not expressly asserting, that all other post-1962 repair alignment readings up to August, 1968 represent "undesirable" alignment merely because they show some sag in either loaded or light condition. This remarkable conclusion is evidently supposed to follow from application of an "important rule of thumb," gleaned by Cargo Underwriters from the testimony of Hellenic's witnesses that the crankshaft would invariably be expected to have a sag with the vessel in light condition and a hog in loaded condition (Appellees' Brief, 8). But their so-called "rule" simply means that, in theory, the crankshaft deflection will tend to go from sag to hog as the vessel is loaded and *vice versa* as she is unloaded. There is no absolute or automatic sag-light/hog-loaded formula, and never has been. Nor does some sag in loaded condition, or some hog in light condition, reflect bad alignment or what Cargo Underwriters choose to call "[un]desirable crankshaft deflection." It is a matter of degree, and, in addition, as Golten, among others, explained, the relationship of the respective readings at the three bearings (Nos. 2, 3, and 4) must be considered to judge the alignment of the crankshaft as a whole (296a-297a). Thus, the Port Sudan readings of .021" sag at No. 2, .021" sag at No. 3, and .020" sag at No. 4 (Exh. 39), with the ship in loaded condition, convinced Allan that the alignment was "almost perfect" (657a); and Haugestad termed the readings "very good" (442a), reflecting "satisfactory shaft alignment (440a)." So also did Lloyd's surveyor who had the responsibility of passing the ship to continue the voyage (Exh. 65).

The fallacy in accepting willy-nilly Cargo Underwriters' so-called "rule of thumb" was exposed by their own counsel on Allan's deposition, though not mentioned by them on this appeal. Despite their commendation of "the fine adjustment made in the shaft by Hellenic after it was repaired at Bombay" in August, 1968 (Appellees' Brief, 2), wire gauge readings, taken less than three months later at New York on November 8, 1968, with the vessel at a light draft of 13'6" forward and 22'0" aft, showed the shaft in a hog rather than sag (Hellenic's Main Brief, 11).² But although this mystified counsel, Allan had the complete answer: the existence of a sag or hog would depend "on how the bearings were lying (665a)." Note also, Haugestad's testimony that, under loaded condition a sag, within limits, is no cause for concern, and that such limits were never approached, let alone exceeded, by the sag in the HELLENIC SAILOR's crankshaft (454a-456a). And it must always be remembered that the whole point of incorporating spherical main bearings into the design of the Sun-Doxford engine was to accommodate fluctuations of the crankshaft when in operation.

In the most blatant form of selective misrepresentation, Cargo Underwriters urge that the necessity for remetalling of the Nos. 2 and 4 main bearings and machining of No. 3 bearing at Bombay after the casualty was not explained, and "is overwhelming proof that before the casualty Hellenic knew that the vessel's crankshaft was not lying in a desirable alignment even taking into account the vessel's draft (Appellees' Brief, 16)." Quite aside from

² Wire alignment readings subsequent to the August, 1968 repairs, including the November 8, 1968 readings, though not introduced in evidence at trial, were identified on Allan's deposition. His record testimony dealt specifically with the hog shown in the November 8, 1968 readings (665a).

the fact that *every adjustment* of shaft alignment includes remetalling the bearings, Cargo Underwriters well know that the crankshaft section procured by Hellenic to replace the fractured one was a ready-made one (the only one available anywhere), which Sun Shipbuilding happened to have on hand. This new section, however, was for a five-cylinder engine, rather than the HELLENIC SAILOR's original No. 2 section. Hence, the 24" diameter of the new No. 3 journal was slightly larger than the remaining journals (as reflected in Exh. Q), and the modifications required to conform the new section to the four-cylinder engine necessarily included machining the No. 3 bearing (660a; 706a: Exh. 31, pp. 35, 37).

**Reply to Cargo Underwriters' Point IV
(Appellees' Brief, 17-21)**

The "trend" theory

Cargo Underwriters advert to Bates' observation that the wire gauge readings showed a trend of greater and greater sag (Appellees' Brief, 17) and, earlier, to the conclusion the District Judge drew from that observation (Appellees' Brief, 9; 600a); but Bates' very observation, programmed as he was to respond to a long hypothetical question by defense counsel, was just plain wrong. The August 2, 1966 readings (Exh. P) show *less* of a sag at No. 3 bearing than the February 1, 1966 readings (Exh. N). This flaw in Bates' theory might not of itself be fatal, but for the sheer absence of support for Cargo Underwriters' further conclusion that the wire gauge readings in evidence "indicated in the main that the crankshaft was running in a continuously sagged condition" (Appellees' Brief,

9).³ That conclusion hardly gibes with the fact that the readings—normally taken about once a year “if nothing else seriously happened” (323a; 176a-177a), in themselves show nothing as to how the shaft was “running” from one day to the next until the taking of subsequent readings (see the discussion in Hellenic’s Main Brief at 36-37). Indeed, while the November 20, 1963 (Exh. L) and September 8, 1964 (Exh. M) readings show an almost straight crank-shaft, the 1966 readings show the shaft to have been lying in the bearings with a sag. Such sag was to be expected in the vessel’s then comparatively light condition, and, as plotted, depicted the shaft in the form of a smooth curve, with the maximum degree of sag in the center of the shaft at No. 3 bearing, as desirable, all readings being well under Haugestad’s 60 thousandths of an inch maximum.

Web Deflection

Cargo Underwriters disregard the testimony of their own expert, Bates, that excessive web deflection could only be caused by “misalignment of the main bearings” or “uneven wear-down of the main bearings” (405a), conditions which could be corrected only by remetalling and remachining the bearings themselves. (See Hellenic’s Main Brief, Points II and III.) Earlier, Bates also testified, in response to a question of defense counsel as to where “stress (on a side web) come[s] from, or what brings in the bending mo-

³ Cargo Underwriters have devised another theory, nowhere supported in the record, but applicable in their view to all the wire gauge readings in evidence, that “a 3 ft. draft differential forward and aft affected the reliability” of these readings (Appellees’ Brief, 10). No witness testified that a difference in forward and aft draft greater than three feet made wire gauge readings “unreliable” (Appellees’ Brief, 15). Allan’s testimony in complete context clearly shows he considered that readings taken with the ship close to an even keel would be “more reliable” and “more indicative of what would be required for correction (634a)” (Hellenic’s Main Brief, 12).

ment": "There are two main directions. First are the allowed bending moments due to the working of the engine. And the weight of the shaft itself. *And then there is the additional stress due to misalignment of the crankshaft* (404a, emphasis added)."

Hellenic's experts testified "that all the necessary, meaningful information can be obtained from a wire gauge reading of crankshaft alignment" on the Sun-Doxford engine, as the District Judge noted and accepted for purposes of his opinion (602a). The wire gauge readings taken before and after the fracture having revealed *no misalignment* of the crankshaft in the bearings, readings derived from measurement of web deflection, had they been available, could not have revealed any misalignment but would have only corroborated the results of the wire gauge readings.

No issue was raised during the trial as to "[t]he suitability of (wire) alignment readings alone for the determination of crank web deflections (Appellees' Brief 20)"; and the notion, implicit in the District Judge's rhetorical question, quoted by Cargo Underwriters (Appellees' Brief, 20; 603a), that, in the last analysis, the object of all types of readings (whether by wire, telescope, or web deflection methods) is to divine the actual physical condition of the crank webs is a myth. The seemingly plausible, yet fallacious line of reasoning seems to be that the more readings of one kind or another on file about the HELLENIC SAILOR's crankshaft, by every available method, prior to the vessel's departure from New York on November 19, 1967 for the Red Sea, the more Hellenic would have known about strain in the webs, which in turn would have told Hellenic that one was about to fracture. In truth, however, had readings of deflections between any two center webs of a Doxford crankshaft shown excessive deflection, neither Hellenic nor any prudent shipowner so alerted, would have remotely

considered having some sort of corrective work done on the crank webs themselves. All corrective measures would be applied to the main bearings. That due diligence could not require Hellenic to destroy the continuous forging(s), which included the side web(s), as would be necessary to test the internal condition of the steel, is only sensible, and clear law as well. (See this brief, *infra*, pp. 24-25.)

Cargo Underwriters seek to perpetuate on this appeal the theory which was misconceived by the District Court that web deflection readings, apart from measuring crankshaft alignment, are taken to "measure web deflection for its own sake (602a)." The District Judge inferred that "the matter of web deflection as an independent measurement, apart from crankshaft alignment, is in and of itself a matter of prime concern, because the web deflection is the thing which sets up the bending moment on the adjacent parts, such as the small web which cracked in this case (603a)." Even Bates could not go so far. In sum, Bates said that, as a matter of science, the only way to be certain that deflection between the center webs was not excessive was to actually measure the distance between the webs. His observation of "trend" in the wire readings led him to conclude that "it would have been prudent to take crank web deflections *at the same time*" as the October 11, 1967 wire gauge readings (399a, emphasis added). Nowhere did Bates contradict, or question, that, as a matter of practice, the wire gauge readings alone are a highly satisfactory and reliable measure of alignment of a Doxford crankshaft, and if the results thereof show excessive misalignment (which the October 11, 1967 wire gauge readings, and those preceding, did not), then the shipowner would be alerted to take prompt and corrective measures by adjusting the bearings.

The proposition that crank web deflections are "a direct reading of the bending stress in the main crank web and

in the side web", as testified to by Bates (402a) (Appellees' Brief, 20), is no more valid than the assumption, falsely attributed to Hellenic, that "wire gauge readings tell all there is to know about stress in a crankshaft" (Appellees' Brief, 17). *Neither* type of readings measures, or is designed to measure, "stress" as such. The object of both methods is to determine alignment or, in other words, how the crankshaft is lying in the bearings. The preference of Hellenic's witnesses for the wire gauge (or telescope) method in measuring alignment of the massive, flexible Doxford crankshaft is because this method measures *directly* how the shaft (i.e., main journals) lies in the bearings, rather than *indirectly* from the distance by which the large crank webs close and open, or deflect, as the shaft is rotated for purposes of such measurement.

Smith's testimony was in no way "confusing" (Appellees' Brief, 17-18). He was testifying to three distinct but related principles in regard to shaft alignment. Sun Shipbuilding had conducted tests of web deflection on an engine of the same type as the HELLENIC SAILOR's, and found that the measurements between center webs would fluctuate, at different positions, by 125 thousandths of an inch (329a). That observation, which Hellenic's witnesses were aware of (192a, 281a, 615a-616a), resulted from Sun's interest in knowing how much the webs played during normal operation (361a-363a), reinforcing Sun's conclusion that the wire method served as a surer guide than any other, by which to determine satisfactory alignment, including alignment of the crankshaft on installation in a new engine. Sun Shipbuilding, as a consequence, never related crankshaft alignment to "web deflection" but rather to the position of the shaft in the main bearings as measured by the wire gauge method. When the wire readings showed excessive misalignment, defined separately as *either* excessive sag

or excessive bearing wear (346a-347a), at a maximum of one eighth of an inch (125 thousandths), then "it was time to realign" (328a) by remetalling the bearings.

Haugestad at no point said he was "not concerned about web deflection on Doxford engines" (Appellees' Brief, 18). His testimony was: either or both the wire gauge and web deflection method could be used to measure "the *alignment* of the crankshaft", but he would never use the web deflection method to measure alignment of the HELLENIC SAILOR's crankshaft as "it only disturbs the whole picture because these deflections are so different from web to web (430a)," a characteristic unique to the Doxford design (431a). On the other hand, the web deflection method was practically the only method used, again to *measure shaft alignment*, on vessels with other-than-Doxford engines, and, thus, a stiffer shaft, though wire gauge readings were done "occasionally" (431a).

Cargo Underwriters urge that the District Judge was free to give "little weight" to Haugestad's testimony as to Doxford engines and web deflection readings (which the judge himself, accepted) on the ground that "Sun had in fact published recommended maximum web deflections for the HELLENIC SAILOR as far back as 1959" (Appellees' Brief, 18). Smith, who had been with Sun Shipbuilding for 43 years, had never seen regulations or charts published by his company in respect of web deflection on Sun-Doxford engines (360a, 363a) and the District Judge did not find that Sun had published any. In his opinion, the judge did "refer to a letter from Sun Shipbuilding & Drydock to the American Bureau of Shipping dated September 14, 1960 [Exh. K], a copy of which went to Hellenic Lines and comes their files (603a-604a)." The judge, however, could not have read another document, published by the

British makers of Doxford engines, William Doxford & Sons, which was in evidence (Exh. 33), and arrived at his conclusion that the "schematic" attached to Sun's letter could or should be relied upon by diesel specialists as a standard in determining alignment or misalignment of a 120-ton crankshaft with 16 webs, where the more direct wire gauge method was available.

A comparison of Sun's letter (Exh. K) with William Doxford & Sons' *Doxford Information Sheet No. 4* (Exh. 33), entitled "Instructions for Permissible Crankshaft Web Deflections," is telling. In respect to the latter, British Doxford's "extensive notes and data" (Appellees' Brief, 19) were compiled by the manufacturer for the reason that in an earlier publication (Exh. 32), the company had

"pointed out that crankshaft deflections at that time did not form as sure a *guide to alignment* for Doxford engines as for some other designs. This question has since been the subject of considerable research and we can now calculate the stresses in the crankshaft corresponding to a set of deflection readings. Adherence to the new instructions for permissible web deflections, which are presented in this information sheet, will ensure that shaft stresses due to *misalignment* do not exceed a safe limit." (Exh. 33, sheet no. 1, emphasis added.)

The theme, repeated throughout this later publication, is illustrated by the following extracts: "If the *misalignment* figures calculated from the web deflections do not comply with the limits given in Sketch No. 53a, b or c according to engine size the *crankshaft must be realigned*" (Exh. 33, sheet no. 2); or, "*Realignment* is necessary" if the

stated figures are exceeded (Exh. 33, Sketch No. 52, emphasis added).

The essential point: excessive web deflection on any Doxford crankshaft could be due only to misalignment; realignment could only be accomplished by remetalling the bearings. The direct—and more reliable—method of determining misalignment on the HELLENIC SAILOR's crankshaft would be the wire gauge method. As Golten said, "if I was out at sea and I had nothing but the deflection instrument, I would take it because it could give me some indication of what is wrong, but I would never use it when I can use something better (302a)."

The District Judge's description of the web deflection method ["to simply measure the distance between the two bottoms of the U, that is, the two large webs, the distance inside the U. This distance is measured at four points in the turning cycle, and the differences in those measurements will measure the web deflection (592a)."], suggests that the judge himself did not clearly understand the procedure.

As noted in Hellenic's Main Brief (20-21), what the judge may have meant to say was that the distance measured is the space between the two tops, *not* the bottoms, of the U formed by the two large center webs and the center crank pin, *i.e.*, the open end. The judge, however, omitted from his description the fact that, in measuring web deflection, the first of the four positions of measurement (that taken with the shaft at the bottom of the stroke, *i.e.*, with the U right side up) is always taken as the *datum point* for purposes of this method of measurement. Whatever the distance between the center webs is measured to be at this position, *e.g.*, two feet, the deflection gauge would be set at zero; then the shaft is rotated 90 degrees at a time, and the distance measured by the instrument,

greater or less than two feet, recorded at each of the three stations. The measurements of the distance between the open ends of the U at three stations, with reference to the first station, thus show how much the large webs open and close as the shaft turns through its rotating cycle.

The District Judge overlooked the analogy that *both* the wire gauge method *and* the web deflection method are based upon a *datum point*. In the case of the wire gauge, the point of reference is a theoretical straight line, fixed by setting the wire so that the distance between it and the top of the No. 1 journal and the distance between the wire and the top of the No. 5 journal is the same. In the case of the web deflection method the *datum point* is the measured distance between the open ends of the center webs in position number 1 (bottom of the stroke) at which position the deflection instrument is set at zero. Excessive misalignment—hog or sag—would be reflected by the web readings recorded with the shaft at the top of the stroke, *i.e.*, with the U upside down. Excessive sag would show a greater distance between the webs than desired, excessive hog a smaller distance than desired, always in relation to the *datum point*.

Cargo Underwriters advert (Appellees' Brief, 21), as did the District Court (604a), to the state of the record on web deflection readings taken between September, 1962 and the commencement of the voyage on which the crankshaft fractured. Web deflection readings taken on October 31, 1960 (Exh. V, first sheet), November 23, 1960 (Exh. V, second sheet), and September, 1962 (Exh. E, sheet 4), were introduced in evidence. These readings were obtained, during the course of discovery, from Hellenic's engineering files maintained in its offices in New York (from whence the HELLENIC SAILOR was superintended from an engineering standpoint).

As the record shows (summarized in "Historical Chronology," Hellenic's Main Brief, 13-16), the HELLENIC SAILOR underwent remetalling and remachining of her main bearings at Genoa between October 31 and November 23, 1960. Exhibit V, therefore, reflects the yard's web deflection readings taken before and after repairs and adjustments of the bearings.

The record further reflects that the HELLENIC SAILOR underwent rebabbitting and remachining of her bearings at Piraeus during September 10-20, 1962. The web deflection readings included in Exhibit E are the readings taken in connection with this realignment of the vessel's crankshaft.

The next and last time anything was required to be done to the HELLENIC SAILOR's bearings was in October/November, 1962 at Port Sudan, where the bearings were overheating. This was not due to any problem of crankshaft alignment, but was due to microscopic pitting in the journals, which required installation of new lower halves at four of the five main bearings.

The engineering files contained no readings in connection with this repair, either web deflection or wire alignment readings, though the record shows that readings were taken (Exh. 62).

Thereafter, up to the HELLENIC SAILOR's arrival at Port Sudan about December 29, 1967 (in tow from the point of crankshaft fracture in the Red Sea), no repairs were required to the bearings. Consequently, there was no reason why the engineering files should have contained any further web deflection readings.

While Allan testified that Hellenic's chief engineers took web deflection readings almost every voyage, he also explained, as the District Court itself observed, that "he would not learn the results of the web deflection readings

unless there was something abnormal (603a, emphasis added)."

The conclusion Cargo Underwriters draw, from alleged non-production, that web deflection readings would be "most meaningful in determining whether in spite of tolerable shaft alignment, the webs themselves are under excessive stress" (Appellees' Brief, 21), is refuted by Allan's testimony that the purpose of web deflection readings "is to insure that the deflection of the webs is not too great *due to possible misalignment* (603a, emphasis added)," as well as by British Doxford's information sheet (Exh. 33, discussed *supra*, this brief, pp. 17-18).

Cargo Underwriters are stymied by the findings at Port Sudan following the fracture: The reason: the HELLENIC SAILOR's shaft was not misaligned either before or after the fracture. Thus, whatever web deflection readings would have shown on October 11, 1967 or in November, 1967, they could not have indicated that corrective measures were required to the shaft which could only be effected by adjusting the main bearings. If due diligence required Hellenic before and at the beginning of the voyage in question to take (and account for) web deflection readings, Hellenic's failure to do so had nothing to do with the fracture. Web deflection readings would not have revealed any misalignment because wire gauge readings—a surer guide in regard to Sun-Doxford shafts—taken before and just after the fracture, did not. In short, there was no misalignment and no corrective measures were required to the bearings.

As this Court has recently explained in discussing the adverse inference that may be raised against a party from his non-production of material evidence in his control, "this inference can of course be rebutted by an adequate

explanation for the non-production." *Tupman Thurlow Co., Inc. v. S.S. Cap Castillo*, 490 F.2d 302, 308 (2 Cir. 1974). Surely, any such inference is also rebutted, and cannot stand, where, as here, the physical facts demonstrate that the documents in question could not have been unfavorable to Hellenic.

**Reply to Cargo Underwriters' Point V
(Appellees' Brief, 21-22)**

Cargo Underwriters have confused the "latent defect" terminology of COGSA § 1304(2)(p), relied upon by Hellenic (Hellenic's Main Brief, Point IV, 43), with that of another COGSA exception, § 1304(2)(m) [relating to "loss or damage arising from inherent defect, quality or vice of the goods"]. The latter of course has no application in this case.

The District Judge's findings with respect to the cause of the crankshaft fracture are summarized at page 19 of Hellenic's Main Brief. While the judge found that there was "no evidence that the fatigue crack started on any visible surface or was visible at or before" the HELLENIC SAILOR's departure from New York on November 19, 1967 (590a), his primary and secondary holdings necessarily imply that the defect which caused the crank web to fracture was "discoverable" at the commencement of the voyage. This is particularly clear from the District Court's misplaced emphasis upon readings of crankshaft alignment by the web deflection method (analyzed in depth at pages 12-22, *supra*).

Proper and reasonable tests Hellenic conducted in respect of the crankshaft's alignment prior to the voyage in question revealed no condition which would have suggested to a prudent shipowner that one of the side webs would

fracture some thirty-six after the vessel's departure from her last port of call. The net effect of the District Court's holdings, notwithstanding proof of such proper and reasonable tests of alignment (the only condition under study), is that a shipowner cannot recover general average contributions from cargo without affirmative proof that the defect which the court, with the benefit of hindsight, infers to have been the unseaworthy condition, was not present prior to the vessel's departure on the voyage. However, as this Court has said, "if positive evidence were required to establish a negative proposition of fact (here absence of a discoverable defect), no carrier could ever discharge its statutory burden of proof." *Peter Paul, Inc. v. Rederi A/B Pulp*, 258 F.2d 901, 906 (2 Cir. 1958), *cert. denied*, 359 U.S. 910 (1959) (vessel suddenly splitting in two at sea due to brittle fracture in her main deck hull plating).

Cargo Underwriters have suggested no tests whatever other than wire gauge and web deflection readings which Hellenic should have conducted to the shaft. [Two tests, intended to detect *surface* cracks in metal—dye-checking and magnafluxing—were raised by Cargo Underwriters at the outset of trial but later abandoned.] Yet here, the "bending stresses", normal or abnormal, or the effect of them in or upon the HELLENIC SAILOR's various main and side crank webs were in no way discoverable by steps which are, or can be, taken by a reasonably prudent shipowner in respect of a Sun-Doxford crankshaft.

Cargo Underwriters contend that Hellenic's reliance on COGSA §1304(2)(p) is "moot", since in their view "if in spite of Hellenic's exercise of due diligence to make the crankshaft seaworthy it fractured, it would be of no consequence if it were caused by inherent (read "latent") defect or some other cause not discoverable by the exercise

of due diligence (Appellees' Brief, 21)." In the District Judge's view, however, the cause of the unseaworthy condition (the fractured crankshaft found during the voyage) determined the standard of "due diligence" by which Hellenic's conduct before the voyage was to be judged.

As Judge Weinfeld said in the course of examining a parallel situation:

"The crucial question on the issue of latent defect is whether it could have been discovered by due diligence before the event—essentially, whether it was discoverable by any reasonable and customary test or inspection before the [vessel] set sail * * *. Since the plate was already in the vessel, it was not possible to give it a physical or chemical test for brittleness."

Margarine Verkaufsunion G.m.B.H. v. M.T. G.C. Brovig, 318 F. Supp. 977, 982 (S.D.N.Y. 1970) (sudden crack in hull plate of a cargo tank while vessel was at sea).

In *The Brovig*, *supra*, the Court found that the cause of the fracture was discoverable only through a destructive test of the metal plate itself, and that no such test was required of the shipowner. And another district judge rejected cargo's contention that due diligence required the shipowner to make certain tests, *viz.* whitewashing or chalking, to detect the condition of a crank web which fractured, stating:

"Such a test might be made in a laboratory, but would not customarily be made aboard a vessel."

The Toledo, 30 F. Supp. 93, 99 (E.D.N.Y. 1939), *aff'd*, 122 F.2d 255 (2 Cir. 1941), *cert. denied*, 314 U.S. 689 (1941).

Neither Cargo Underwriters nor the District Court have suggested any "practical tests" which could have been performed on the HELLENIC SAILOR's crankshaft, or any of its component parts, that would or might have avoided this casualty. *Balfour, Guthrie & Co. v. American-West African Line*, 136 F.2d 320, 321 (2 Cir. 1943), *cert. denied*, 320 U.S. 804 (1944); *Margarine Verkaufsunion, G.m.B.H. v. M.T. G.C. Brovig*, 318 F. Supp. 977, 983 (S.D.N.Y. 1970). Hellenic submits that there were none.

CONCLUSION

For the foregoing reasons and reasons stated in Hellenic's Main Brief, the judgments should be reversed with directions to enter judgment in favor of Hellenic on both complaints.

Dated: New York, New York
September 17, 1975

Respectfully submitted,

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